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(54) Abstract Title
A loudspeaker using an adsorbent hydrophobic mass within the cabinet

(57) A loudspeaker uses within the cabinet adsorbent material, and/or containment means for the adsorbent material, which is at least partially hydrophobic in order to prevent moisture effecting the mass. Preferably, the material is activated carbon treated to provide it with hydrophobic properties. This improves the acoustic compliance of the loudspeaker. The activated carbon may be replaced by aerogel.

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IMPROVEMENTS IN LOUDSPEAKERS

This invention relates to loudspeakers, and in particular to the achievement of maximum bass performance from a minimum size of loudspeaker cabinet.

Numerous attempts have been made to extend the low frequency performance of small loudspeaker systems. However, none of these have so far proved to be successful commercially.

10 In GB2146871B there is described a technique for eliminating or substantially eliminating pressure variations in an essentially closed volume, such as the interior of a loudspeaker cabinet. The essentially closed volume of the cabinet is effectively reduced in volume when the loudspeaker
15 cones make excursions into the interior of the cabinet. Such excursions tend to increase the pressure in the cabinet and these pressure variations are reduced by locating a mass of material within the cabinet, the material being adsorbent to the gas or vapour in the cabinet. The adsorbing material can
20 be a mass of activated charcoal or carbon in granular form. The granules are described as being held in place by a mesh-like support structure which can be a moulding of plastics material or formed from expanded metal sheet. This can be lined with a porous fabric such as filter paper to prevent
25 small granules from passing through the support structure.

In GB2146871B it is mentioned that it is desirable to keep the carbon granules free from moisture. Methods of attempting to achieve this described in the aforesaid patent specification include the provision of a moisture impermeable
30 diaphragm located within the box between the granules and the speakers, and also the use of a moisture barrier to prevent

moisture from entering the region of the mass of carbon granules.

It has now been established that the effect of moisture on the performance of loudspeakers which contain an adsorbing material is not insignificant. Activated carbon adsorbs moisture from the air and this blocks the microporous structure of the granules. One way to try to overcome this problem is to keep moisture out of the cabinet, for example using a metal rather than a wooden cabinet, and without any ports, for example made of extruded aluminium.

An alternative approach, which is the subject of the present invention, is to use adsorbing material and/or the containment means for it which is at least partially hydrophobic, i.e. water-repellent. In this way one can achieve compliance enhancement of the loudspeaker, i.e. an improvement in the acoustic compliance. In other words, the loudspeaker cabinet can be made to seem acoustically bigger without any physical change to the cabinet. Alternatively, the same acoustic output can be obtained with a cabinet of smaller size.

Broadly in accordance with one aspect of the present invention there is provided a loudspeaker comprising a cabinet within which there is provided an adsorbent material which is or which has been treated to make it at least partially hydrophobic.

Broadly in accordance with another aspect of the present invention there is provided a loudspeaker comprising a cabinet within which is located adsorbent material which is within containment means which is or which has been treated to be at least partially hydrophobic.

Clearly, it would also be possible within the scope of

the invention both to use hydrophobic adsorbent material and also to make the containment means water-repellent as well.

The adsorbent material is preferably activated carbon, suitably treated to provide it with hydrophobic properties.

5 Another material which could be used is aerogel, which is highly adsorbent.

A fact which needs to be considered in the design of a loudspeaker cabinet containing such compliance enhancement material is how the material is to be presented to the air. 10 Desirably, one needs to achieve maximum exposure of surface area to the air within the cabinet. Whether one uses hydrophobic carbon and/or a water-repellent containment material, it is desirable not to use a large solid mass of compliance enhancement material, but to use a modular 15 arrangement, for example of tubular bags of material linked together by webbing. Such tubular bags can be laid in layers, at right angles to one another, to give little contact between the individual bags and an optimum surface area of exposure to the air. Alternatively, a number of tubular bags of 20 material can be arrayed in the form of a curtain within the cabinet, again with a view to achieving maximum exposure of the material to the air.

If the compliance enhancement material, such as hydrophobic carbon, is contained within a bag or bags, the bag 25 material can be a multi-filament synthetic textile material.

References herein to the compliance enhancement material being hydrophobic is not intended to exclude materials which are not 100% hydrophobic. The invention is intended to cover compliance enhancement materials which have been treated to 30 improve their hydrophobic qualities, even if they cannot be said to be truly hydrophobic. The same is true in respect of

the containment material. Material treated to improve its water-repellent characteristics is to be regarded as falling within the scope of the present invention, even if the material is not then 100% water-repellent.

CLAIMS:

1. A loudspeaker comprising a cabinet within which there is provided an adsorbent material which is or which has been treated to make it at least partially hydrophobic.
- 5 2. A loudspeaker comprising a cabinet within which is located adsorbent material which is within containment means which is or which has been treated to be at least partially hydrophobic.
3. A loudspeaker as claimed in claim 1 or 2, in which
10 the adsorbent material comprises activated carbon.
4. A loudspeaker as claimed in claim 1 or 2, in which the adsorbent material comprises aerogel.
5. A loudspeaker as claimed in claim 2, in which the
containment means comprises a plurality of separate modules
15 each containing the adsorbent material.
6. A loudspeaker as claimed in claim 5, in which the
containment means comprises a plurality of bags of material
which are linked together.
7. A loudspeaker as claimed in claim 6, in which the
20 bags are made of a multi-filament synthetic textile material.



INVESTOR IN PEOPLE

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Claims searched: All

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Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK C1 (Ed.T): H4J (JBA)
Int C1 (Ed.7): H04R 1/02, 1/28
Other: Online: EPODOC, WPI, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2146871 A (WARD) See figure 1, and note mass 20 and channel 30.	2, 3

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
& Member of the same patent family

A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.